Quick guide

Neandertals

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What is a Neandertal? A Neandertal (*Homo neanderthalensis* or *Homo sapiens neanderthalensis*) is a kind of human that lived in Europe and Western Asia until around 30,000 years ago. The first Neandertal skeleton was found by quarry workers in 1856 in the Neander Valley in Germany. At first people thought the odd-looking skeleton was that of a diseased person or of a Cossack from the Napoleonic War. It was only later, when similar remains were found in Belgium, that Neandertals became fully accepted as an extinct type of human. Since then, a debate about their relationship to modern humans has raged among paleontologists and geneticists, and inspired many writers of fiction.

How can you distinguish a Neandertal from a modern human? Around 400 fossils of Neandertals or their direct ancestors are known, and several almost complete skeletons have been discovered, including immature individuals. They show that Neandertals looked very different from extant humans. In fact, morphometric comparisons show that Neandertals were as different from modern humans as are closely related species of great apes from each other, such as bonobos and common chimpanzees. They had large brains in elongated braincases, receding foreheads and supraorbital buttresses. Their faces were long and very projecting in the mid-part, with large noses and no chins. They had large husky bodies weighing around 80 kg. Their bones and muscles were extremely robust, maybe partly because of their behaviour and level of activity. However, some of the typical features of Neandertals, for example the shape of the inner ear, were established even before birth. To sustain their muscular bodies they required lots of calories per day. Isotopic studies show that they did this by eating a lot of meat and fat.

Where did they come from and where did they go? Neandertals evolved mostly in Europe, where populations suffered several demographic crashes and some level of isolation due to dramatic climatic fluctuations during the last half million years. During this time, Neandertals accumulated more and more differences from humans living in Africa, where direct ancestors of modern humans evolved. Neandertal populations expanded into the Near East and Central Asia. In other periods, modern humans expanded into the southern Near East. Between 50–40,000 years ago, modern populations expanded out of Africa, eventually replacing other human forms, including Neandertals.

Did Neandertals and modern humans get on? The general global answer to this question has become much clearer thanks to paleoanthropology and molecular genetics. Paleoanthropological evidence indicates that Neandertals were mostly replaced, with very rare, if any, interbreeding. However, the most recent Neandertals developed behaviours and technology that resemble that of the African immigrants. For example, some of them started using body ornaments for the first time after the arrival of modern humans who had practiced this behaviour for a long time. Such interactions suggest some period of coexistence, although the replacement of the Neandertals may have happened differently in different areas. However, so far, there is no direct evidence that the two groups lived in close contact.

What have genetic studies of Neandertals revealed? In 1997 a segment of mitochondrial DNA was retrieved from the original

The Saint-Césaire skull from France. One of the youngest Neandertals.

Neandertal bones found in 1856. Its DNA sequence fell outside the variation of modern human mitochondrial DNA sequences, and shared a common ancestor with them on the order of half a million years ago, while all corresponding sequences of extant humans share a common ancestor less than 200,000 years ago. If this had concerned field mice or some insect, the arguments would surely have ended here with the conclusion that these were two distinct populations. However, as it concerns our own species, scientists have continued to debate about the genetic relationship between the two human forms. In the meantime, it has been shown that a number of well-preserved Neandertals contain DNA sequences similar to the first one, while equally well-preserved anatomically modern humans do not. Also, none of many thousands of humans living today have been found to carry such divergent DNA sequences. Given these facts, the contribution of the Neandertals to the gene pool of modern humans can only be minor — if any.

What happened to the Neandertals? We will probably never know in detail. Their

technology was very similar to that of their modern human contemporaries, they cared for their injured, and we have yet to last as long as a species on this planet as they did. However, modern humans went on to develop symbolic representation, complex social organisation, and also language in a way that was probably unmatched by the Neandertals. In the end, the nature of our speculations about what happened to the Neandertals may say more about us and how we see the current world than about what really happened 30,000 years ago. Some are convinced that Neandertals were the victims of an early genocide by modern humans — a consequence of our inherently violent nature. However, in the Middle East Neandertals and modern humans overlapped in the same general area for over 50,000 years and must at least have met some times — a fact that can be regarded as an encouraging example of long-term coexistence between two different forms of humans.

Where can I find out more?

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Book review

Professor Jekyll and Comrade Hyde

Walter Gratzer

J.D. Bernal – The Sage of Science
Andrew Brown
(Oxford University Press, Oxford)
ISBN 0-19-8515448 973-0-19-851544-9

"For 50 years he has, over and over again, astounded the scientific world by his extraordinarily original and fertile concepts, which show a depth of understanding and brilliance of thought possessed, in my opinion, by no other living man. He is one of the greatest men in the world." This from Linus Pauling, who was not noted for shows of deference to even the most illustrious of his confrères. John Desmond Bernal was indeed a genius. He illuminated each of the many territories of science on which he set foot, and he left his imprint on history. A rewarding subject, then, for a biographer, and Andrew Brown has made the most of it.

Bernal sprang from Irish farming stock, but with a dash of French and of Jewish blood. He shocked his family with an early display of independence when he came out for Sinn Fein, but it was only in Cambridge, among the youthful left-wing patriciate, that he experienced a true transfiguration: the strict Catholicism in which he had been reared was supplanted by an even more fervent belief in communism and the brotherhood of man. In Cambridge, also, following a relatively unpropitious start reading mathematics, he was drawn to physics, captivated mainly by the principles of symmetry. He failed to achieve a First because, Brown suggests, he had laboured mightily to derive the 230 symmetry space groups. This secured him a University prize — shared with R.W.G. Norrish, Nobel Laureate to-be, and the hated research supervisor of Bernal's future protégée, Rosalind Franklin — but without a First there could be no place for him in the hub of physics, Rutherford's Cavendish Laboratory (nor did his Lordship tolerate political activists in his realm). But Bernal's supervisor of studies recognised his qualities and commended him to Sir William Bragg, director of the Royal Institution in London. There, he quickly gave evidence of the preternatural originality and quickness of grasp that were to mark his career. His first achievement was to uncover the structure of graphite and explain its properties. In between he found time to publish a book, *The World, the Flesh and the Devil*, an extended essay in futurology, which Arthur C. Clarke has called "the most brilliant attempt at scientific prediction ever made" and one that inspired many of his own conceits. This was followed a year later by *Unholy Alliance*, a philippic against the Church.

Bernal had acquired the nickname of 'Sage', from his all-embracing learning and seeming infallibility, while still an undergraduate, and Sage he remained to his friends throughout his life. It may also have been the spontaneity, the luminous intelligence and the sparkle of his conversation that made him so irresistible to women; his sexual appetites indeed appeared unquenchable. At a later stage of his life, his secretary and the wife of his friend and collaborator, Isidore Fankuchen, formed themselves into an exclusive society of 'Women who have never been to bed with Sage', one as president, the other as treasurer. But it was not long before Mrs Fankuchen received a cable announcing that she was henceforth president *and* secretary. Even after Sage's first stroke he charmed and bedded the much younger wife of his actor friend, Miles Malleson, and Brown has unearthed a touching letter that she sent Bernal when he was dying, attended by his three 'wives' (to the first of whom he was legally married). After serving